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ANNUAL REPORT

OF THE

SUDAN VETERINARY SERVICE

FOR THE YEAR

1949.

BUREAU OF HYGIENE & TROPICAL DISEASES
26 MAR 1954

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ANNUAL REPORT

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FOR THE YEAR

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GENERAL.

Notwithstanding the many difficulties encountered, such as shortage of professional staff and lack of adequate road and river transport, good progress was made in the control of the major contagious diseases.

Distinguished visitors whom the department was particularly pleased to welcome in the Sudan were Professor P. A. Buxton, who toured part of the tsetse fly belt and trypanosomiasis areas ; Dr. Kelly, Chief of the Animal Breeding Division of the Scientific and Industrial Research Organisation of the Commonwealth of Australia, who investigated the suitability of Sudan Zebu cattle for Australian conditions ; Dr. Colbeck, Director of Veterinary Services of the Belgian Congo, who toured in Darfur Province ; and Dr. J. R. Furlong, Principal of the Plant and Animal Productions Division of the Imperial Institute, who accompanied by Mr. W. E. Palmer of Messrs. Whitby Bros., Ltd., Yeovil, and Mr. J.N. Keir of Messrs. Percy E. Fisher Ltd., Basingstoke, discussed ways and means of improving the quality of hides and skins.

SECTION I.

STAFF.

Losses by retirement included Mr. J. E. Furney, Assistant Director (Administration) who had served for 20 years, Messrs. C. N. Chappel and J. S. Robertson, Veterinary Inspectors, and Ahmed Eff. Mahmoud Hamza, Veterinary Assistant, who had served for 32 years.

Three veterinary inspectors, Messrs. D. J. Stewart, A. Pollock and A. W. Polden arrived on first appointment and one veterinary officer, Ahmed Eff. Mohd. Dahab, a diplomate of the Khartoum Veterinary School, joined the department. A veterinary entomologist and a laboratory technican were selected for appointment but had not arrived before the end of the year.

Notable promotions included Mr. J. D. M. Jack from Senior Veterinary Inspector to Assistant Director (Administration), Messrs. J. K. Thomson and P. Z. Mackenzie from Veterinary Inspector to Senior Veterinary Inspector, and El Amin Eff. Abdulla El Karib and Mohd. Eff. Ali Meheimid from Assistant Veterinary Research Officer to Veterinary Research Officer.

The Assistant Director (Research) was given the additional appointment of Commissioner for Animal Trypanosomiasis Control and became responsible for recommending to the Livestock and Veterinary Policy Standing Committee measures to be taken for the control of trypanosomiasis in domestic livestock both outside and inside tsetse infested areas.

Distribution of classified staff on 31st December, 1949, was as follows :—

Designation	Name	Station
Director	W. H. Glanville, 4N. M.R.C.V.S. ..	Khartoum
A/Director (Adm.)	J. D. M. Jack, M.R.C.V.S.	Khartoum
Senior Veterinary Inspector ..	I. A. Gillespie, M.R.C.V.S.	El Fasher
,, ,, ,, ..	A. W. Chalmers.	El Obeid
,, ,, ,, ..	P. Durran, M.R.C.V.S.	Malakal
,, ,, ,, ..	J. K. Thomson, M.R.C.V.S., D.V.S.M. ..	Wad Medani
,, ,, ,, ..	P. Z. Mackenzie M.B.E., M.R.C.V.S. ..	Wau
Veterinary Inspector ..	H. B. Luxmoore, B.SC., M.R.C.V.S. ..	Torit
,, ,, ...	D. G. Clow, M.R.C.V.S.	Malakal
,, ,, ...	C. P. Williams, M.R.C.V.S.	Kassala
,, ,, ...	Ibrahim Moud. Khalil, Dip. Vet. Sci.	Shendi
,, ,, ...	M. J. Hennigan, M.R.C.V.S.	Yirol
,, ,, ...	D. J. Stewart, M.R.C.V.S.	El Obeid
,, ,, ...	A. Pollock, M.R.C.V.S.	El Obeid
,, ,, ...	A. W. Polden, M.R.C.V.S.	Wad Medani
Veterinary Officer	Zein El Abdin Mahmoud Dip Vet. Sci.	Wadi Halfa
,, ,, ...	Ahmed Magdoub Abdoum, Dip.Vet.Sci.	Khartoum
,, ,, ...	Hussein Hassan Abbo, Dip. Vet. Sci...	Nyala.
,, ,, ...	Ahmed Mohd. Dahab, Dip. Vet. Sci.	Malakal
Inspector H. Q.s.	J. McKay	Khartoum
Inspector of Hides	E. Knew, Dip. Leathersellers College	Omdurman
	RESEARCH.	
A/Director (Research) ..	J. T. R. Evans, B.SC., M.R.C.V.S. ..	Khartoum
Veterinary Research Officer	F. W. Priestley, M.R.C.V.S. Dip. Bact. (Lond).	Khartoum
,, ,, ,, ..	El Amin Abdulla El Karib, Dip. Vet. Sci.	Nyala.
,, ,, ,, ..	Mohd. Ali Meheimid, Dip. Vet. Sci.	Malakal
Veterinary Officer	El Nazeer Dafalla, Dip. Vet. Sci. ..	Khartoum
,, ,, ,, ..	Saad Mahanna Ahmed. Dip. Vet. Sci.	Khartoum
Pasture Research Officer. ..	M. N. Harrison, B.SC., (Agric.) ..	Khartoum

Other technical staff totalled 81, an increase of five over 1948 while unclassified staff increased by 35 to 441.

SECTION II.

DISEASES OF ANIMALS.

Cattle Plague.

Following satisfactory field trials in northern and southern cattle, attenuated goat virus vaccine obtained from the Veterinary Research Laboratory, Kabete, Kenya, was used on a large scale for the first time in the Sudan during December. By the end of the month some 24,000 cattle had been vaccinated in the Bahr-El-Ghazal Province. Casualties resulting from vaccination were no higher than expected and were less than one per cent. During the first half of the year 121,000 cattle in the province had been vaccinated with inactivated glycernised lymphoidal tissue vaccine. Some 20,000 doses of serum were used in the control of outbreaks. Cattle plague, which up to a couple of years ago was the major killing disease of cattle in the Bahr-El-Ghazal Province has been successfully overcome by large scale vaccination of susceptible stock. As a result of the remarkable progress made during recent years in gaining the confidence of the animal owners and overcoming native prejudices, the way is being prepared for an attempt at eradication of the disease.

There was a further decrease in the number of outbreaks and losses in the Blue Nile Province. 23,000 doses of serum were used in the control of outbreaks while 55,000 doses of vaccine were used for the immunisation of cattle not associated with out-breaks. In addition 3,000 working bulls in the Irrigated Area were immunised by the serum-virus method.

The disease was present in various parts of Darfur Province throughout the year but losses generally were low. 30,000 doses of serum were issued for the control of outbreaks. Approximately 200,000 doses of vaccine were used in the mass immunisation scheme. The mishap arising out of contamination of last years vaccine with tetanus and blackquarter did not have very serious consequences and it was fortunate that the number of animals involved was small. The accident did not seem to have affected confidence in the vaccine.

The vaccination of all cattle, with the exception of those of the Bari, west of the Nile in Equatoria Province, resulted in the elimination of the disease in an area where losses had been heavy the previous year. East of the Nile serumisation and quarantining were used to control the sporadic outbreaks which occurred. A total of 15,000 doses of vaccine and 15,000 doses of serum were used in the province.

A few outbreaks occurred in Kassala Province during the first five months of the year but from June to December the province was free of the disease. 18,600 doses of vaccine and 2,000 doses of serum were administered.

Khartoum Province had 5 small outbreaks with a total loss of only ten cattle. 270 cattle were serumised in the control of these outbreaks. 1,300 cattle were prophylactically vaccinated.

The incidence of the disease in Kordofan Province was very low. 15,000 doses of serum were used in the control of outbreaks. The large scale immunisation scheme in Dar Messeria, where 90,000 doses of vaccine were used, effectively controlled the disease in this important cattle rearing area. Elsewhere in the province 38,000 doses of vaccine were administered.

With the exception of the Merowe/Dongola District the Northern Province remained free of the disease throughout the year. Kordofan cattle which had evaded the quarantines at Debba and Tangasi were responsible for five small outbreaks on the Dongola Reach, were 22 deaths occurred in cattle whose owners had managed to evade the vaccination campaign of 1948. 160 cattle were serumised and 660 vaccinated in connection with the outbreaks while 8,000 doses of vaccine were utilised in areas not associated with the disease.

Scattered outbreaks occurred among the Shilluk in the Upper Nile Province during the first few months of the year but these were quickly suppressed and this tribe remained more or less free of the disease until the end of the year. In March the disease unfortunately became widespread on the Zeraf Island and complicated the mass trypanocidal treatment then in progress. In May outbreaks were occurring in Eastern and Western Nuer Districts and while the disease died out in June on the Zeraf Island it was on the increase in Western Nuer District. For the latter half of the year outbreaks were scattered and comparatively few in number. 26,000 doses of serum and 28,000 doses of vaccine were used in the province.

Contagious Bovine Pleuro-Pneumonia.

Despite the fact that 31,000 cattle were vaccinated against the disease in 1949 compared with 24,500 in 1948 and 15,500 in 1947 the disease reached epidemic proportions in many parts of the Bahr-El-Ghazal Province during the latter part of the year. Factors responsible for the unsatisfactory position included a very large nomadic cattle population always on the move, unwillingness of the owners to slaughter infected animals and an insufficiency of vaccine. Each year the output of vaccine from the research laboritories is increased but production is limited by shortage of staff and equipment. At the end of the year there were indications that the 1950 output would be increased substantially.

Compared with 1948, the incidence of the disease decreased in the Irrigated Area of the Blue Nile Province but increased greatly in the White Nile Area. Over 8,200 cattle were vaccinated in the province.

The disease was present throughout the year in all districts of Darfur Province. In October it was reported from the Beni Helba area which has been free for a number of years. The danger of purchasing cattle from French Equatorial Africa was emphasised by cattle merchants who in several cases lost a very high percentage of their herds through the introduction of such animals. 14,500 doses of vaccine were used in the province.

In Equatoria Province where 5,000 doses were issued the vaccine has earned a high reputation for its efficacy and it was impossible to meet the big demand for it from cattle owners.

Kassala Province, as in 1948, remained free of the disease.

Two small outbreaks which were quickly suppressed occurred in Khartoum Province. 250 doses of vaccine were issued in connection with the outbreaks.

The disease was prevalent in Kordofan Province where it was present throughout the year. There is little liklihood of an improvement in the position until it is possible to enforce compulsory slaughter and to implement a policy of restricting merchants cattle to trade routes sited as far distant as practiable from cattle rearing areas. 10,500 cattle were vaccinated in the province.

The disease in Northern Province was confined to one case in a cow at Borgeig in the Merowe/Dongola District. There was no spread of the disease following slaughter of the infected animal and vaccination of 1,000 cattle in the neighbourhood of the outbreak. It is believed that the origin of the disease was a " lunger " imported from Kordofan Province which had been subsequently slaughtered for meat.

10, 500 doses of vaccine were used in the Upper Nile Province where the disease existed throughout the year in all districts.

Bovine Trypanosomiasis.

The large scale treatment with dimidium bromide of cattle in the heavily infected areas of the Bahr-el-Ghazal Province, which had been started late in 1948, was continued and in January a further 18,000 cattle were treated. In February losses from photosensitisation, amounting to about 5½ per cent of those treated, were reported. Only fat and healthy cattle appeared to be adversely affected. The result of the campaign appeared to be a complete eradication of the disease in most of the treated areas. A further 4,500 clinically infected cattle were treated during the year with dimidium bromide with very satisfactory results in Lakes District in outbreaks occurring along the fly belt fringe. Antrycide was made available in May for the protection of slaughter cattle moving from the Bahr-El-Ghazal Province through the fly belt to the meatless areas of Equatoria Province. During the year 543 cattle treated prophylactically were exported on the hoof with excellent results. Since June about 60 working bulls of the Forestry Department have been maintained in good health whilst working in tsetse fly country by antrycide injections every two months.

At no time was the disease of great significance in the Blue Nile Provinces. Sporadic cases occurred at Sennar and in the White Nile area.

Considerable losses occurred among Fellata and Habbania herds of Darfur Provinces. As a result of poor grazing on the

Bahr-El-Arab river in March and April their owners risked the tsetse fly belt and moved their animals south west from Jebel Cheili.

Losses from this disease were large in Equatoria Province both within and without the tsetse fly areas. Dimidium bromide was used successfully in the non-tsetse areas while stibophen and later antrycide were effectively used for the control of the disease in government herds in the fly belt. Samples of tsetse flies from various parts of the province were collected for identification.

No positive cases of trypanosomiasis were observed in Kordofan Province and losses, if any, must have been negligible.

The large scale treatment of cattle in infected areas of the Upper Nile Province was continued and over 227,000 were inoculated with antrycide. The campaign met with varying degrees of opposition from the Nilotic cattle owners who are naturally suspicious of new drugs but with the energetic co-operation of district commissioners and many of the chiefs, it was possible to achieve inoculation of a remarkably high percentage of the cattle in the areas selected for treatment. The temporary toxic effect sometimes observed—more often in young animals—caused some alarm in the early stages of the campaign and further complications were encountered in the appearance of cattle plague and contagious bovine pleuro-pneumonia at certain centres. The degree of clinical infection varied enormously, not only from district to district, but from cattle-camp to cattle-camp. It is difficult to estimate the percentage of infected cattle as a whole but it is certain that many thousands of cattle which would have died of trypansomiasis were successfully treated and that the chances of re-infection were reduced to a minimum. The senior veterinary inspector of the province reported that when touring among treated cattle about two months after inoculation the effect could only be described as spectacular. Herds which were previously noted to have a very high percentage of advanced clinical cases were seen to be fit and well. Cattle owners expressed themselves as well satisfied and quite a number who had evaded treatment were asking for it. The year's antrycide work brought the total of cattle in the province which had received trypanocides to almost 550,000 head.

Camel Trypanosomiasis.

Owing to the exceptionally light rains in the camel rearing areas there was a large decrease in the incidence of the disease. Demands for antrypol were the lowest for years. 31,000 doses were issued compared with 55,000 in 1948. The further spread of antrypol resistant strains in many areas also contributed to the reduction in demands for treatment. Shenabla camels driven by mistake to Delami—a tsetse fly area in Kordofan Province—contracted a T. congolense infection which caused the death of 30 camels before treatment with antrycide prevented further losses.

Foot and Mouth Disease.

The appearance of this disease in cattle at the export quarantine parks in April and also in late October was responsible for the export trade being held up for a total of five weeks. A few mild sporadic outbreaks occurred in Bahr-El-Ghazal, Darfur, Kassala, Khartoum and Kordofan Provinces.

Haemorrhagic Septicaemia.

Small sporadic outbreaks which appeared in Bahr-El-Ghazal, Blue Nile, Kassala and Upper Nile Provinces were successfully controlled by vaccination.

Anthrax.

Losses from this disease in the export quarantine parks were again negligible. Nil reports were returned from the majority of the provinces.

Crytococcus Infections.

The number of equines destroyed suffering from this disease totalled 40 and was the lowest number for many years.

Rabies.

Reported losses from rabies were 74 compared with 83 in 1948. The following table shows the number and distribution of positive cases :—

PROVINCE.	Dogs	Donkeys	Cats	Cattle	Sheep	Goats	Hyaenas	Total
Blue Nile	29	1	—	—	1	1	—	32
Kassala	13	2	2	1	—	—	—	18
Kordofan	10	—	—	—	—	—	—	10
Khartoum	4	3	—	—	—	1	1	9
Northern	1	—	1	—	1	—	—	3
Darfur	1	—	—	—	—	—	—	1
Bahr-El-Ghazal	—	—	—	1	—	—	—	1
TOTAL	58	6	3	2	2	2	1	74

Control measures included the destruction of 1056 dogs in the Blue Nile Province ; 49 dogs and 911 cats in Khartoum Province and 1420 dogs, 484 hyaenas, 318 foxes and 286 jackals in Northern Province.

Other Diseases.

Other diseases and ailments which received attention during the year included the following :—

Tetanus in cattle, horses and donkeys.
Blackquarter in cattle.
Fascioliasis in cattle and sheep.
Malignant catarrh in cattle.
Actinomycosis in cattle.
Contagious abortion in cattle.
Mastitis in cattle.
Tuberculosis in cattle.
Psoroptic and demodectic mange in cattle.
Piroplasmosis in cattle and dogs.
Anaplasmosis in cattle.

Theileriasis in cattle.
African horse sickness in equines.
Biliary fever in horses.
Strangles in horses.
Ulcerative cellulitis in horses.
Encephalo-myelitis in horses.
Ringworm in horses.
Bursati in horses.
Botryomycosis in horses.
Bee stings in horses.
Sarcoptic mange in camels and sheep.
Contagious necrosis in camels.
Strongylosis in camels.
Entropion in camels.
Abcesses of the pedestal in camels.
Retention of urine in camels.
Sheep pox.
Haemonchus contortus infestation in sheep.
Caseous lymphadenitis in sheep.
Contagious pneumonia in goats.
Distemper in dogs.
Feline enteritis in cats, lions and leopards.
Avian diseases including spirochaetosis, fowl pox, fowl cholera, tuberculosis and laryngo-tracheitis.

SECTION III.

TRADE IN LIVESTOCK AND LIVESTOCK PRODUCTS.

EXTERNAL TRADE.

General.

Despite hold-ups, due to foot and mouth disease and transport difficulties at various times of the year, amounting to over 10 weeks, there was a considerable increase in all exports of livestock and livestock products, the total value of which amounted to over £E. 3¼ millions.

Cattle and Sheep.

33,331 cattle valued at £E. 471,039 were exported compared with 21,583 valued at £E. 318,158 in 1948. Practically all cattle were exported to Egypt, about 39 percent being exported via Port Sudan to Suez and the remainder via the Nile Valley route to Cairo A few young stock of the Kenana breed of cattle from the Research Farm, Wad Medani, were exported by air to Tripoli for breeding purposes.

Sheep exports totalled 52,884 valued at £E. 212,346 compared with 36,070 valued at £E. 128,318 in 1948. 36,644 head were exported to Egypt mainly via Wadi Halfa while 16,240 head were exported to Saudi Arabia via Port Sudan and Jeddah.

Camels.

It is estimated that 78,000 camels valued at £E. 1,977,000 compared with 54,650 valued at £E. 1,200,000 in 1948, were exported to Egypt by overland routes.

Hides, Skins and Leather.

Hide exports continued to increase greatly and totalled 2,383 tons valued at £E. 373,409 compared with 1991 tons valued at £E. 271,380 in 1948 The principal importers were Egypt 1355 tons, Greece 282 tons, Italy 231 tons and the United Kingdom 205 tons. 376,904 hides, an increase of over 90,000 over last year's figures, passed through the export grading depots. Approximately 82,000 were dry salted hides from the slaughter houses in the Blue Nile, Khartoum, Kordofan, Northern and Kassala Provinces. Of the 295,000 air dried hides graded, 261,000 were from Darfur Upper Nile and Bahr-El-Ghazal provinces. The percentage of frame dried hides was lower than last year—7.2 percent compared with 10 percent—but varied from 0 percent in Blue Nile, Kassala and Northern provinces, 3.6 percent in Kordofan Province, 4.7 percent in Darfur Province, 6.4 percent in Bahr-El-Ghazal Province 10 percent in Khartoum Province, 12.4 percent in Upper Nile Province to 30 percent in Equatoria Province. Upper Nile Province with 10,744 hides was far and away the largest producer of frame dried hides. The grading depot at Wadi Halfa was closed down during the year.

Sheep skin exports totalled 1366 tons valued at £E. 204,866 compared with 1235 tons valued at £E. 213,362 in 1948. The United Kingdom with 815 tons, the United States of America with 384 tons and the Netherlands with 108 tons were the principal buyers.

Goat skin exports totalled 224 tons valued at £E. 44,673 compared with 145 tons valued at £E. 31,619 in 1948. The United States of America with 93 tons, the United Kingdom with 45 tons, the Netherlands and France each with 26 tons and Italy with 24 tons were the biggest importers.

Exports of other hides and skins chiefly snake, crocodile and lizard amounted to 7 tons valued £E. 11,843 compared with 10 tons at £E. 13,363 in 1948. Egypt imported more than half of the total.

Leather exports totalled 92 tons valued at £E. 30,281 compared with 149 tons at £E. 47,757 in 1948. With the exception of 3 tons of light goat leather which was exported to the United Kingdom, Egypt received all exports of leather.

INTERNAL TRADE.

Livestock Markets and Slaughtering Figures.

The numbers of cattle, sheep, camels and goats sold in the main internal markets continued to increase ; over ½ million animals being sold for £E. 1,673,000. Details of these sales were 381,690 sheep for £E. 680,815, 110,718 cattle for £E. 668,794, 25,348 camels for £E. 304,386 and 18,885 goats for £E. 27,561. Compared with the previous year average prices decreased for camels and there was little change in cattle, sheep and goat prices. The average price of cattle sold in the El Obeid market was lower than last year ; £E. 4,962 compared with £E. 5,079.

There was an increase in the number of cattle, sheep and goats slaughtered in the 10 principal towns of the Sudan. Figures for the past two years are as follows :—

	Sheep	Cattle	Goats	Camels	Total
1948	258,692	39,033	21,799	1,892	321,416
1949	262,683	44,768	26,096	1,704	335,251

Hides and Skins.

The hides section staff toured the provinces and attended various agricultural shows, demonstrating hide improvement methods. A very successful course of instruction in flaying and frame drying was given at Malakal to tribal retainers from the Bor District of the Upper Nile Province. Arrangements were made for similar courses to be given to tribal retainers from other districts.

Further improvements were made to the Khartoum slaughter house and plans were well forward for the reconstruction of many slaughter houses in the provinces. The work of flayers in a number of slaughter houses was very poor and more effective control of their work is difficult without legislation.

Large numbers of hides severely damaged by the larvae of the hide beetle continue to arrive at the grading depots. This damage could be largely avoided if traders made use of the modern insecticides which are now available in most markets.

The Inspector of Hides while in the United Kingdom discussed with hide importers the possibility of developing a market for tanned goat skins from Darfur Province.

SECTION IV.

Animal Husbandry and Livestock Improvement.

Grazing conditions over a large portion of the northern part of the country were exceptionally poor due to inadequate rains and considerable losses in flocks and herds were reported from many areas. There was a southward migration on an unprecedented scale into the rain belt of Darfur and Kordofan Provinces by northern nomads seeking water and grazing for their camels and sheep. This abnormal migration in addition to facilitating the spread of disease resulted in large areas which are normally grazed only in the rains, being grazed in the summer and winter. It remains to be seen how the grazing will stand up to such treatment.

Despite the difficult year Government animals kept in good health and the wastage from all causes was estimated at 10 percent compared with 15 percent last year.

The Senior Veterinary Inspector of Kordofan Province rendered much assistance to the Dar Messeria District Council in their efforts to improve the cattle of the dar. During the rains over 15,000 scrub bulls were castrated. 30 Kenana bulls from the Blue Nile

Province were distributed for stud purposes and it is proposed to purchase another 50 bulls of the same breed in addition to some Beni Helba stud bulls from Darfur Province.

A new dairy was opened at Malakal in November. This consists of an excellent brick byre with standings for 42 cows and with milk room, office and store attached. The dairy is run under the supervision of the Senior Veterinary Inspector and has a trained northern dairyman in charge. In the short time in which the new dairy has been working, the benefits of extra feeding, fly proof byre and improved management have been amply demonstrated. Many new cows have been sent to the dairy from outstations and by a gradual process of selection only the best will be retained. Apart from providing a good town milk supply it is hoped that the dairy will afford a useful opportunity for experiment and training. For the first 10 months of the year the old Malakal dairy was continued on more or less native lines. Of cows which calved and completed their lactation during the year, the average period was 38 weeks. The highest total individual yield was 286 gallons and the highest recorded daily yield was 17 pints.

New dairies were built at Yirol sub-district headquarters and Rumbek primary school, on a new pattern designed by the Senior Veterinary Inspector of the Bahr-El-Ghazal Province. 8 stud bulls were moved from the Aliab country in Lakes District to Aweil District in an attempt to improve the size and milk yield of the latter district's very small cattle.

The Torit dairy in Equatoria Province was run under the direct supervision of the department. Production has been greatly increased but does not yet satisfy more than quarter of the demand in Torit.

A scheme to test the possibilities of improvement of the local breed of poultry in Equatoria Province was started by the department at Torit. The object of the scheme is to produce crossbred R.I.R. X. indigenious cockerels for issue to native owners. Foundation R.I.R. Stock was purchased in Uganda.

Over 9,000 horses attended the four horse shows held in Darfur Province. About 11 percent were offered for sale. The number of horses purchased was 107 of which 14 were selected for use as tribal stallions. The Senior Veterinary Inspector was of the opinion that there is no doubt that good general purpose remounts are becoming fewer although the total number of horses in the tribes is as great as ever. It is even more difficult to obtain the extra good quality horses suitable for stud purposes. The present system of keeping tribal stallions has its limitations. It was suggested that some stallions should be taken over by the Southern Darfur District Council and stand at stud at various points according to the season. In this way it is hoped that better use would be made of the horses than is possible when they are the private property of an omda or other notable.

Services of the two Government stallions stationed at Nahud and Abu Zabad in Kordofan Province totalled 66, while services by 3 tribal stallions in Dar Messeria totalled 167.

In Khartoum Province the arab stallion Mozer covered 28 mares. The stallion Ramleh was destroyed in April and was replaced by an arab horse, Gawhar, purchased in Egypt. He was sent to Northern Province in November when Registan returned to Khartoum. While standing at Shendi, Registan covered 23 mares in the period January to October.

SECTION V.

EDUCATION.

Most veterinary inspectors devoted considerable periods of time to training subordinate staff. Veterinary Inspector, Equatoria Province reported that there are something like fifteen local languages in the province among the livestock owning tribes and it is very unusual for a man of one tribe to be able to speak other languages besides his own. The people of all tribes are always ready to suspect the intentions of a man from another tribe. These facts lead to difficulties in recruitment and training. Men from every livestock owning tribe were trained as stockmen in Equatoria Province. Tuition was carried out in English.

SECTION VI.

MISCELLANEOUS.

Veterinary Hospitals and Dispensaries.

Veterinary hospitals and dispensaries throughout the country had a busy year. In the Blue Nile Province 5414 animals were treated as out-patients at Wad Medani hospital. A new dispensary was built at Hassaheisa. In Northern Province the construction of new dispensaries at Merowe and Dongola was completed. 3,585 animals were treated at the various hospitals and dispensaries in the province. A new sheep quarantine for export sheep was constructed at Wadi Halfa in place of the old unsuitable enclosures in Halfa town. In the Bahr-El-Ghazal Province a veterinary hospital was established at Wau and dispensary stores at Gogrial and Yirol.

REVENUE AND EXPENDITURE.

The following figures show the actual revenue and expenditure of the department for the past three years.

	1947	1948	1949
1. Revenue	75,515	70,529	73,138
2. Expenditure			
(i) Personnel and Personal Allowances	57,582	73,787	78,171
(ii) Services..	57,449	67,746	61,846
(iii) Capital	1,577	8,708	3,233
TOTAL	116,608	150,241	143,250
3. Development Budget	673	4,465	75

W. H. GLANVILLE. Director
Sudan Veterinary Service

ANNUAL REPORT OF THE ASST. DIRECTOR (RESEARCH).

A. STAFF.

The establishment of the technical classified staff of the Research Section was increased by one Veterinary Research Officer, two Laboratory Technicians and three Veterinary Assistants, and at the end of the year consisted of the following posts :—

1 Assistant Director (Research).
4 Veterinary Research Officers.
2 Assistant Veterinary Research Officers.
1 Pasture Research Officer.
1 Veterinary Entomologist.
2 Veterinary Assistants.

The Assistant Director (Research) was given the additional appointment of Commissioner for Animal Trypanosomiasis Control from March 1st and became responsible for recommending to the Livestock and Veterinary Policy Standing Committee measures to be taken for the control of trypanosomiasis in domestic livestock both outside and inside tsetse infested areas.

El Amin Eff. Abdulla El Karib, Dip. Vet. Sci. (Khartoum) and Mohamed Eff. Ali Mihemied, Dip. Vet. Sci. (Khartoum) were promoted Veterinary Research Officers (Scale CS.I.) with effect from 1st January, 1949. These officials who have each received a year's post-graduate training in England, the former at the Liverpool School of Tropical Medicine and the latter at the London School of Hygiene and Tropical Medicine, were responsible primarily for the production of the country's supply of cattle plague vaccine and antiserum at the branch laboratories at Malakal and Nyala.

The posts of one Veterinary Research Officer, two Assistant Veterinary Research Officers, one Veterinary Entomologist and two laboratory Technicians remained vacant throughout the year. Two Veterinary Officers were however attached to the Research Section and these will become eligible for consideration for promotion to Assistant Veterinary Research Officers in 1951. One Veterinary Entomologist and one Laboratory Technician were selected shortly before the end of the year.

B. BUILDINGS.

None of the buildings applied for were built and as a consequence research and the preparation of some biological products were handicapped.

C. ROUTINE WORK.

Routine work took up most of the staff's time. It consisted mainly of the production of biological products, the distribution of these and of others purchased from abroad, the distribution of antrypol for the treatment of camel trypanosomiasis and the examination of specimens submitted for diagnosis.

The sources of these products and the totals distributed (with comparative figures for 1948) are shown in Table I, and the distribution of the products amongst the provinces is shown in Table II. Brief notes follow on the items that merit comment.

TABLE I.

Product	Source	Doses distributed	
		1949	1948
Cattle Plague Vaccine	Malakal Nyala Laboratories	587,020	1,041,315
Goat Virus Vaccine	Kenya	26,250	—
Cattle Plague Antiserum	Malakal Lab.	164,000	147,000
Cattle Plague Virus	Khartoum Lab.	4,686	5,000
C. B. P. P. Vaccine	Khartoum Lab.	112,875	103,775
Haemorrhagic Septicaemia Vaccine.	Khartoum Lab.	8,400	12,485
Blackquarter Vaccine	Khartoum Lab.	2,580	900
Foot and Mouth Virus	Khartoum Lab.	34,140	32,184
Horse Sickness Vaccine	South Africa	1,136	1,307
Anthrax Vaccine	Kenya	43,016	27,199
Antrypol	I. C. I. Ltd.	31,010	55,097

TABLE II.

PROVINCE	Northern	Khartoum	Kassala	Blue Nile	Kordofan	Darfur	Upper Nile	Bahr El Ghazal	Equatoria	Head-quarters
Cattle Plague vaccine ..	11,840	1,280	19,040	43,930	180,180	175,000	20,480	120,020	15,250	—
Goat Virus vaccine	—	—	—	—	—	—	—	26,250	—	—
Cattle Plague Antiserum ..	—	—	15,000	22,000	24,000	22,000	15,000	15,000	15,000	36,000
Cattle Plague virus	—	46	—	4,040	300	—	—	—	—	—
Bovine Pleuro-pneumonia vaccine	2,175	500	—	13,700	40,200	14,500	10,350	26,400	5,050	—
Hemorrhagic Septicaemia vaccine	—	—	60	4,440	—	—	2,400	1,500	—	—
Blackquarter vaccine	—	—	—	—	1,080	480	—	1,020	—	—
Foot and Mouth virus	650	240	—	—	33,250	—	—	—	—	—
Anthrax Vaccine	110	950	65	7,565	31,326	3,000	—	—	—	—
African Horse Sickness vaccine	90	108	140	553	77	106	15	43	4	—
Antrypol	—	510	10,500	7,000	11,000	2,000	—	—	—	—

1. Cattle plague vaccine (inactivated glycerinised lymphoidal tissue).

It became necessary in 1949 to begin routine bacteriological and biological testing of all batches of vaccine produced because some of the previous year's output had been contaminated with pathogenic anaerobes, notably *Clostridium tetani*; between three and four thousand cattle died of tetanus as a result of inoculation with this vaccine.

This additional operation had the effect of reducing markedly the output of vaccine and it was not possible to supply all the demands for the product.

2. Cattle plague attenuated virus vaccine.

This vaccine, obtained from the Veterinary Research Laboratory, Kabete, Kenya, gave satisfactory results when tested in both Northern (short horned zebu) and Southern (sanga) cattle. Large scale application of this method of immunisation was started in December and by the end of the year some 24,000 cattle had been vaccinated. Casualties resulting from the inoculation of the vaccine were no higher than were expected and were less than one per cent.

3. Cattle plague antiserum.

There was still a considerable demand for this product which continued to be the most satisfactory agent for controlling outbreaks of cattle plague in very remote areas where only occasional visits by veterinary staff are practicable and in areas that are inaccessible during the rainy season.

The technique of production was the same as that employed for several years. Potency tests showed that the serum was up to the usual standard, namely, that at 4 cc per 100 lbs. body weight it protected against severe symptoms of cattle plague and at 8 cc per 100 lbs. body weight it protected against any symptoms of infection other than a rise of temperature.

4 Contagious bovine pleuro-pneumonia vaccine.

Although more of this vaccine was produced than in any previous year the output was sufficient to supply only a fraction of the demands. The factors limiting production were again shortage of staff and equipment but at the end of the year there were good prospects of early improvement in the situation.

5. Antrypol.

The issues of antrypol for the treatment of camel trypanosomiasis were the lowest for many years. There was no doubt that the antrypol-resistant strain of *T. evansi* mentioned in previous reports, had spread extensively and that the marked reduction in the demands for the drug was largely due to the increasing frequency with which it failed to cure the disease.

6. Diagnosis of specimens.

Fifteen hundred and thirty one specimens were submitted by the field staff for examination. The diagnoses were representative of those made almost every year and the only ones worthy of special mention are :—tuberculosis in a Southern bull (Sanga), a Northern cow (short horned zebu), and a monkey ; *Pseudomonas pyocyanea* enteritis in a white rhinoceros ; aspergillosis in a parrot ; laryngotracheitis and fowl cholera in fowls.

D. RESEARCH.

1. Mass treatment of bovine trypanosomiasis with antrycide methylsulphate.

Experimental work carried out in 1948 had shown that antrycide methylsulphate cured *Trypanosoma congolense* infection in cattle at a dosage of 2.0 mg. per kilo. body weight and a field trial of the drug in a herd of nearly three hundred cattle, in which the incidence of trypanosomiasis was high, had given very satisfactory results. The drug was found to be less active against *T. vivax* infection but it appeared that at a dosage of 5.0 mg. per kilo. body weight it cured the two strains against which it was tried. It was decided on this evidence to use antrycide methylsulphate in preference to dimidium in the campaign to control the epizootic of bovine trypanosomiasis in the Southern Sudan ; it was a safer drug and it appeared to be more effective therapeutically.

The available evidence indicated that in this epizootic the disease was transmitted by flies other than tsetses and that the species of trypanosome responsible for infection in the immense majority of cases was *T. congolense.* By fixing the dosage of the drug for field use at 5.0 mg per kilo. body weight, generous latitude was being allowed to ensure that all cattle infected with *T. congolense* would be cured and it seemed that there was a good chance that most of those infected with *T. vivax* would also be cured. It was, however, realised that there was a risk of creation of antrycide-resistant *T. vivax* in those cases in which the drug failed to cure but it was felt that even if this happened the number of animals so affected would be a very small fraction of the total cattle and that the consequences would not be serious. Furthermore it appeared justifiable to take this risk in view of the mounting losses from the epizootic which called for the urgent application of the most effective measures available. A higher dosage of the drug could not be recommended because even at 5.0 mg kilo. some cattle, particularly young stock and those infected with intercurrent disease, became very distressed after inoculation.

The risk appeared to have been fully justified by the results as the compaign proved to be marked success. Virtually all the cattle in one area of about 25,000 square miles and numbering over a quarter of a million were inoculated. Several thousands of them, many from heavily infected herds were inspected a few months after treatment and were seen to be in good condition. Losses from the disease were reported to have ceased and blood examinations of representative groups of cattle from many herds showed no trypanosomes.

2. Treatment of Trypanosoma vivax infection with antrycide methylsulphate.

While the mass treatment referred to in the previous section was being carried out a new strain of *T. vivax* was obtained. Two-year old cattle were artificially infected with it and treated with varying dosages of antrycide methylsulphate with results that are summarised in the following table. The criterion for judging cures was failure to find trypanosomes on examinations of thick dry smears taken three times weekly over a period of sixteen weeks.

TABLE III.

Number of Cattle treated	Dose per kilo body weight	Relapsed	Cured
9	1.0 mg	9	0
5	2.0 mg	4	1
10	3.0 mg	8	2
9	5.0 mg	3	6
4	7.5 mg	0	4

The four cattle which relapsed after treatment at 2.0 mg. per kilo first showed trypanosomes in their blood between the 26th and 36th days after treatment. They were all treated on the 60th day at 5.0 mg. per kilo. and no trypanosomes were found on examination of their bloods three times weekly during the following sixteen weeks. This result suggests that the trypanosomes had developed no significant resistance to antrycide as a result of the inoculation of a subcurative dose of the drug.

3. Therapeutic and prophylactic values of antrycide for Trypanosoma evansi infection in camels.

The following tables and comments summarise the results of the experimental work carried out to deterime the therapeutic and prophylactic values of both antrycide dichloride and antrycide methylsulphate. In all the experiments the camels were infected artificially and the drug was administered by subcutaneous inoculations.

TABLE IV.

Antrycide chloride—curative results.

Number of camels treated	Dose per kilo body weight	Results
4	1.0 mg	2 relapsed 2 cured
4	2.0 „	3 „ 1 „
5	4.0 „	1 „ 4 „
4	10.0 „	0 „ 4 „

Comments.

In all the camels which relapsed trypanosomes were first found in the blood between the 22nd and 74th days after treatment. The criterion for judging cures was failure to find trypanosomes by examination of thick dry smears taken three times weekly. With the first three dosages this was carried out over a period of 107 days, and with the 10.0 mg per kilo. dosage, over a period of 150 days. In addition, in the 10.0 mg per kilo. group, a positive mercuric chloride reaction became negative in each camel within two months of inoculation of the drug.

TABLE V.

Antrycide chloride—prophylactic results.

Number of camels inoculated	Dose per kilo. body weight	Interval between treatment and challenge with T. evansi.	Result
		days	
1	5.0 mg	22	Negative
1	,,	39	Negative
1	,,	50	Negative
1	,,	62	Negative
1	,,	78	Positive
1	10.0 mg	22	Negative
1	,,	39	Negative
1	,,	50	Negative
1	,,	62	Negative
1	,,	78	Negative
3	,,	121	Negative
3	,,	218	Negative

Comments.

The positive camel showed trypanosomiasis first on the 65th day after challenge.

In the case of the three camels challenged after 121 days, examisations of thick dry smears taken three times weekly over a period of 216 days were negative. Weekly mercuric chloride tests during the six months following challenge were all negative.

One of the camels challenged after 218 days died on the 62nd day. Postmortem examination revealed a large staphylococcal abscess in the liver. Examinations of thick dry blood smears taken three times weekly until the day of the death were negative. Weekly mercuric chloride tests were all negative. Similar blood examinations of the other two camels in this challenge group showed no trypanosomes up to the 137th day, the last day of examination. Weekly mercuric chloride tests all gave negative reactions.

TABLE VI.

Antrycide methylsulphate—curative results.

Number of camels treated	Dose per kilo body weight	Results
6	2.0 mg	3 relapsed 3 cured
9	5.0 mg	0 ,, 9 ,,

Comments.

Examination of thick dry blood smears taken three times weekly, in the case of those camels cured by 2.0 mg per kilo over a period of 141 days, and in the case of those camels cured by 5.0 mg per kilo over a period of 136 days, were all negative. The three relapses occured on the 74th, 74th and 99th days, respectively, after treatment.

Weekly mercuric chloride tests of those camels cured with 5.0 mg per kilo were positive immediately after treatment but all became negative within three months.

TABLE VII.

Antrycide methylsulphate—prophylactic results.

Number of camels inoculated	Dose per kilo body weight	Interval between treatment and challenge with T. evansi	Result
3	10.0 mg	65 days	2 Negative and 1 Positive
3	10.0 mg	130 days	3 Positive

Comments.

In the group challenged after 65 days the infected camel first showed trypanosomes on the 65th day after challenge.

In the second group the camels showed trypanosomes first on the 4th, 6th and 34th days, respectively, after challenge.

Note :—In all the prophylactic trials, controls of the challenging infections were included and in every case they showed trypanosomes within six days of inoculation.

Field trial of antrycide methylsulphate as a curative.

One hundred and eighty nine camels infected with *T. evansi*, the vast majority of them having previously failed to respond to treatment with antrypol, were treated subcutaneously with a 10 per cent. solution of antrycide methylsulphate at a standard dosage of 2.0 grams per beast. Their average weight was about 400 kilos.

The Veterinary Officer in charge of the operation reported that seven camels died within two days of treatment. These were either heavily infected with trypanosomes or in a very emaciated condition at the time of inoculation. Five months afterwards he reported that as far as could be ascertained all the other camels had recovered and the trial was judged by the camel owners to have been a great success.

4. Tests of attenuated goat-virus vaccine on indigenous cattle.

A sample of attenuated goat virus vaccine (750th passage) was obtained from the Veterinary Research Laboratory, Kabete, Kenya and tested on a group each of Northern and Southern cattle. It produced satisfactory results and inoculation of the vaccine, purchased from the same source, was started on a large scale in the Bahr-el-Ghazal Province in December.

The results of these tests of the vaccine may be briefly summarised as follows :—

(*a*) *Northern cattle* (short horn zebu).

Fifty six cattle were inoculated with the goat virus vaccine and were kept under natural conditions. They were confined in enclosures at night but were sent out to graze in the day time and were watered every other day. Twenty of them had their temperatures taken morning and evening. Fifteen of these showed typical thermal reactions and some lachrymation and five of them developed slight diarrhoea. Some of the cattle were off their food for one or two days but none of them was seriously ill.

Twenty three days after vaccination all the cattle plus eighteen controls were inoculated with virulent bovine cattle plague virus and morning and evening temperatures of twenty vaccinated cattle and of all the controls were taken. None of the vaccinated cattle developed fever but eleven of the controls showed typical cattle plague thermal reactions and classical symptoms of the disease.

(*b*) *Southern cattle* (Sanga type)

A similar test was carried out with a group of these cattle kept under natural conditions. Sixty of them were inoculated with the goat virus vaccine and twenty five showed typical thermal reactions. Many of the latter showed lachrymation and two of them had diarrhoea for two days ; they all continued to feed well.

Fifteen days after vaccination these cattle and twenty calves were inoculated with virulent bovine cattle plague virus. None of the vaccinated cattle showed thermal reactions but six of the controls developed severe cattle plague and died.

E. PASTURE SURVEY.

The Pasture Research Officer continued his task of surveying the grazing areas of the Sudan and a full report will be written when the work is completed. Some conclusions relating to the districts he visited, and which are incidental to the survey work, are summarised below.

(*a*) *West Bank Equatoria Province.* This part of the province possesses vegetation that could, under good grazing management, be converted into high productive pasture, provided dry season forage is made available and measures are taken to prevent soil erosion.

(*b*) *Bahr-el-Ghazal Province.* The area of good swamp pasture available for grazing towards the end of the dry season is very limited. The cattle population is already approaching the maximum that these areas can carry but by basin irrigation of the relatively poor river valley pastures it may be possible to provide additional grazing during the dry season and so reduce the danger of overstocking that will otherwise inevitably be a sequel to the present policy of large scale use of prophylactics against cattle plague and contagious bovine pleuro-pneumonia.

(c) *Southern District, Darfur Province and Western District, Kordofan Province.*

The riverain grazing during the dry season could be supplemented substantially by providing watering facilities in many areas which at present have to be deserted shortly after the end of the rainy season. Surface storage of water for the use of cattle grazing in these areas should be provided by excavated earth tanks (hafirs) and a priority list of the order in which they should be dug has been prepared.

F. PUBLICATION.

One paper was published during the year :—

Thomson, J. K., Priestley, F. W., and Polding, J. B. Enteritis of a white rhinoceros associated with *Pseudomonas pyocyanea* infection, Veterinary Record 1949, Vol. 60, 30.

G. ACKNOWLEDGMENTS.

The failure again to recruit professional staff entailed heavy demands being made on the existing officials and it is a pleasure to acknowledge their willing response.

The value to the Sudan Veterinary Service of close co-operation between the laboratory and field staff was again amply demonstrated and I wish to acknowledge particularly the valuable help given by Messrs P. Durran, and D. G. Clow and Hassan Eff. Hussein Abbo in preliminary trials of antrycide in the control of trypanosomiasis in cattle and in camels.

J. T. R. EVANS,

23/2/1950. *Assistant Director (Research).*

IMPERIAL B
25
PICAL DISEASES